

## CLAIMS

What is claimed is:

1. A powerful shock absorber and accelerator device, comprising:
  - an inner chamber containing a gas,
  - an outer storage chamber for containing compressed gas, the outer storage chamber having an outer storage chamber outer wall that has a wide midsection,
  - an inner wall defining a boundary between the outer storage chamber and the inner chamber, the inner wall having an aperture defined therein,
  - a piston and a piston rod, there being a clearance between the piston and the inner wall, the piston rod including a ram actuator slidably disposed in and initially sticking out of a rear of the piston rod at a beginning of a retraction stroke
  - the piston, upon the exertion of a force against the piston rod, moving through a retraction stroke and compressing gas in the inner chamber and driving the gas through the aperture to the outer storage chamber, movement of the piston beginning when a force exerted against the ram actuator causes the ram actuator to slide through and stick out of a forward end of the piston and become flush with the rear of the piston rod whereupon the force is exerted against the piston rod,
  - a sealing structure that seals the clearance so that when the piston moves through a portion of the inner chamber during an intermediate phase of a retraction stroke the aperture is sealed, the aperture staying sealed during a remainder of the retraction stroke,
  - a counterforce-generating member,

a gas passage from the outside chamber to the counterforce-generating member,  
the counterforce-generating member for moving the ram actuator through the piston and  
for opening the gas passage to allow flow of compressed gas that moves the piston an initial  
distance to initiate an extension stroke, said initial distance being sufficient to release the sealing  
of the aperture,

the piston, upon the release of the sealing of the aperture, being accelerated for a  
remainder of the extension stroke by compressed gas that rushes in from the outer storage  
chamber to the inner chamber, and

the gas passage for conveying compressed gas to the counterforce-generating member  
after the counterforce-generating member has begun to move in order to help the counterforce-  
generating member make the ram actuator slide through the piston and move the piston the initial  
distance, and

a venting pathway from the inner chamber to an area external to the device for venting gas  
in the inner chamber at approximately the completion of the retraction stroke.

2. The device of claim 1, including a valve for controlling the venting pathway, the valve  
extending from and connecting to the counterforce-generating member.

3. The device of claim 1, wherein the aperture is situated as close to a point of a  
completion of the retraction stroke as possible while still being situated. so that additional  
movement of the piston can occur during the retraction stroke after the sealing of the clearance.

4. The device of claim 1, wherein the venting pathway terminates at an end of the device adjacent the counterforce-generating member.

5. The device of claim 1, wherein the aperture is substantially perpendicular to a direction of the retraction stroke and is large enough to minimally restrict a flow of compressed gas.

6. The device of claim 1, wherein the aperture is substantially annular and is substantially perpendicular to a direction of the retraction stroke.

7. The device of claim 1, wherein the sealing structure comprises at least two o-rings located on the piston.

8. The device of claim 1, wherein the inner chamber and the outer storage chamber are cylindrical.

9. The device of claim 1, wherein the gas is air.

10. The device of claim 1, wherein the gas is nitrogen.

11. The device of claim 1, wherein the valve includes a narrow valve member that is struck by the piston during a completion of the retraction stroke.

12. The device of claim 1, wherein the valve is a spool valve.

13. The device of claim 1, wherein the valve is a poppet valve.